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A TECHNICAL AND ECONOMIC STUDY OF WASTE OIL RECOVERY.

PART II: AN INVESTIGATION OF DISPERSED SOURCES OF USED CRANKCASE OILS

TEKNEKRON, INCORPORATED

PREPARED FOR
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Part II: An Investigation of Dispersed Sources of Used Crankcase Oils

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AN INVESTIGATION OF DISPERSED SOURCES OF USED CRANKCASE OILS

1.0 INTRODUCTION

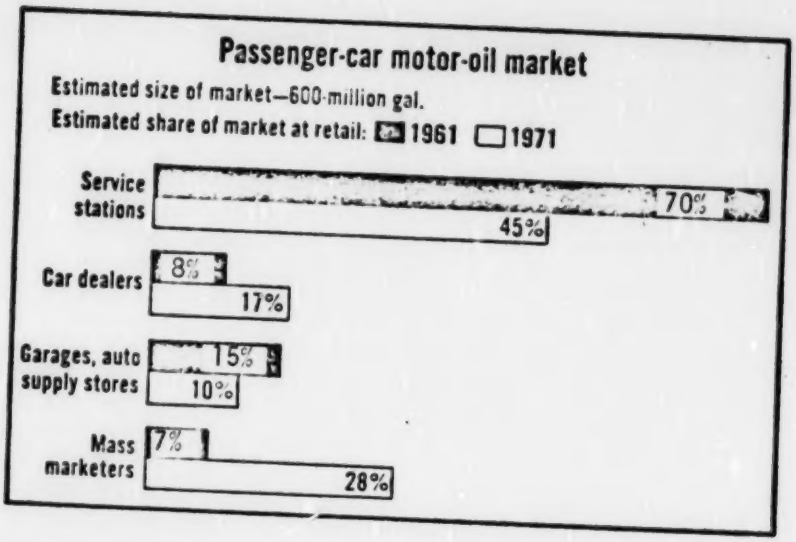
Since the early 1960's the sales distribution of automotive engine oil has shifted drastically from service stations to retail stores which sell major brands of oil at discount prices. As shown in Figure 1, in 1961 service stations accounted for about 70 percent of all sales of lube oil for passenger cars while mass marketers accounted for just 7 percent of this market. By 1971, service stations' share of the lube oil market had fallen to 45 percent. Most of these sales were lost to mass marketers whose market share had climbed to 28 percent. By the late 1970's some oil industry officials expect that mass marketers will have cornered 40 percent of all passenger car lube oil sales with service stations accounting for only 35 percent of the market.

This shift in lube oil sales patterns has also brought about a marked change in the disposition of waste crankcase oils. Formerly more than 80 percent of all used oils from passenger cars were handled by service stations, car dealers, or garages who, in the main, either paid collectors to haul the oil away or received a payment from collectors for the waste oil. The collectors would sell the used oil to re-refiners and producers of asphalt or use the oil for highway maintenance and dust control. At present, less than 60 percent of these wastes are handled in this fashion. Prior to the present study no information was available as to the ultimate disposition of more than 40 percent of all used crankcase oils from passenger cars.

Indiscriminate disposal of used crankcase oils can lead to serious pollution problems if the oil is discharged to a body of water or if it is dumped on the ground and seeps through to the water table. In addition, lubricating oils are a valuable resource and are now in short supply. Further, the survival of many companies which re-refine used oils is being threatened due to inadequate supplies of feedstock.

In order to estimate the magnitude of dispersed sources of used oil, the methods of used oil disposal and consumer attitudes towards oil purchases (especially the purchase of recycled oil), a study was made of the purchase attitudes and disposal practices of persons who buy automobile crankcase oil in discount stores and subsequently change their own oil. In cooperation with West Coast Community Surveys, Inc. of Berkeley, California, and Prof. Francesco Nicosia of the University of California at Berkeley, a questionnaire was prepared and used in interviews with approximately 600 persons who were buying oil at discount stores in Oakland, California. A copy of the questionnaire is contained in Appendix A of this report. The results of the survey were analyzed and interpreted by Prof. Nicosia. The results of this analysis form the basis of this report.

Figure 1



Source: National Petroleum News: McGraw Hill, Inc; New York; August, 1971, p.54.

2.0 SUMMARY OF FINDINGS AND CONCLUSIONS

In this survey consumers who change their own engine oil have been interviewed. The main purposes of the interviews were to identify the ways these consumers dispose of the used oil, to estimate the quantity of oil disposed of in each way, and to probe into the psychological predispositions that underlie the choice of different methods. The stress was on problems concerning pollution, although some attention was given to problems concerning conservation of resources.

The research design chosen was as follows. "Discount" stores in the Oakland, California,area, and a few in near-by areas, were selected on a judgmental basis. Permission from the store managers was obtained to interview buyers of engine oil in the store. 598 personal interviews were obtained during the last three weeks of August 1973. The completed questionnaires (Appendix A) were coded and verified: key punching and contingency cleaning were followed by data analysis.

The structure of the analysis and the findings are presented in the report beginning on page 9 . The following section summarizes the results of data analysis according to the areas of interest explored.

OIL PURCHASES AND TYPES OF BUYERS

During the interviewing days, 3,027 quarts of oil were purchased. Of this amount, 774 quarts were purchased for adding only; 1,722 for oil changing only; and 531 quarts for both adding and changing oil.

On the basis of respondents' estimates, the total annual volume of oil purchases for oil changes only amounts to 13,300 quarts, for a mean of 27.4 quarts per year per respondent.

Several demographic characteristics are related to purchases of oil--age, education, income, race, and type of residence (e.g. house or apartment). For example, respondents in their forties, with about twelve years of schooling, and relatively higher incomes (about 93 respondents) record a mean annual purchase of 31.4 quarts; whereas subjects in their sixties, with about 10 years of schooling, and relatively lower incomes, record a mean purchase of 21.9 quarts per year.

WHAT KIND OF OIL IS PURCHASED AND WHY?

A very large proportion of the respondents buy "high reputation" oils. For example, over 55% of the respondents bought brands like Pennzoil, Quaker State and Castrol, and another 20% bought brands such as Standard, Shell, Chevron and Havoline (Texaco). Furthermore, about 80% of the interviewees bought high quality, heavy duty oil (API grades SC, SD, and SE).

Brand name and lowest price are the most frequently mentioned reasons for oil purchases. Note, however, that those who buy larger quantities of oil tend to be less concerned with price than those who buy smaller quantities of oil. A factor analysis of the "reasons for purchase" strongly suggests that the respondents tend to buy oil directly from "discount" stores in order to save money vis-a-vis the prices prevailing at gasoline stations and car dealers. Yet among the brands available in such stores, the respondents tend to buy the more expensive products.

LOCATION AND REASONS FOR CHANGING ONE'S OWN OIL

Over 80% of the respondents mentioned "home garage" or "street or driveway" as the location where they change engine oil. The most important reason for doing so is cost (64%); "auto hobby" and "better for car" are the next most important reasons (24%).

DISPOSAL OF THE USED OIL AND PREDISPOSITIONS TOWARD ECOLOGICALLY SOUND MEANS OF DISPOSAL

About 33% of the interviewees dispose of the used oil by dumping it in the backyard or elsewhere on the property. The remainder of the respondents dispose of their used oil in the following manners: service stations (15%), public dump (11%), storm sewer (11%), garbage can (10%), empty lots (3%), and other means (17%). The quality of oil disposed of by each of these means, per year, follows the same order of importance. For example, 3,776 quarts per year are dumped in backyards while 394 quarts per year are dumped in empty lots.

Some of the methods of disposal mentioned by the respondents require more effort and activity than others. About 40% of the oil is disposed of by methods requiring a high level of activity (taking it to service stations, public dumps, or empty lots). Thus a significant amount of human energy might be harnessed by a program concerned with returning used oil to central collection facilities.

Furthermore, those consumers who dispose of the used oil by high activity methods tend to experience more trouble in getting rid of their used oil than those who use methods requiring a low level of activity such as dumping the oil in backyards and storm sewers.

HOW MUCH USED OIL WILL BE RETURNED?

The respondents were asked a hypothetical question: "If all oil were sold in resealable containers, how likely would you be to return your used oil to a collection facility?" The level of willingness is high: 35% said they would definitely do so, and 30% said they would probably do so.

However, experience suggests that responses to hypothetical questions are not reliable. The data analysis shows that the level of expressed willingness varies a great deal according to two underlying psychological factors: (a) whether the respondents experience trouble with their present method of disposal of used oil, and (b) whether their method implies a high or low level of activity.

More importantly, the amount of used oil that may be returned varies not only by the level of respondents' willingness but also by the amount of trouble experienced and type of disposal method. There is some evidence that three variables may affect "amount of returned used oil" in a non-linear fashion.

This section concludes with an illustration of the wide range of estimates of the total amount of used oil that may be returned, and with some

suggestions of how this range may be narrowed. There is a need for further analysis if policy decisions are to be based on the prediction of how much used oil is likely to be returned if oil is sold in resealable containers.

ARE THERE OTHER FACTORS AFFECTING WILLINGNESS TO RETURN USED OIL?

Factors which may affect the amount of used oil the respondents would return to collection facilities have been considered. Two variables were derived -- "ecology consciousness" and "conservation awareness" -- but data analyses, although limited, show weak or no relationships between those scales and willingness to return used oil.

Another potentially very important factor does not seem to be related to the likelihood of returning oil. We asked the interviewees to express what would be the minimum deposit charge that would make them return a resealable container. Here it was found that those who buy large volumes of oil are no more likely to mention a low deposit than those who buy small volumes of oil; similarly, those in higher income groups are no more likely to mention a high deposit than those in lower income groups. Further analysis may clarify this lack of association.

A PROBE INTO CONSERVATION OF RESOURCES

As mentioned above, the stress of the research design was on problems concerning pollution. Regarding conservation of resources, it was found that the willingness to buy recycled oil -- if government certified -- is high: 57% of the respondents said that they would definitely buy or probably buy (26% and 31%, respectively). Further analysis of this willingness is advisable for here, too, the respondents were reacting to a "hypothetical" question.

The study indicated that labeling of recycled oil may be a significant factor in the public's assessment of its quality. The survey showed that the term "re-refined" implies "high quality oil" for 51% of the respondents, while "reprocessed" implies high quality for 20%, and "recycled" for 13% of the respondents.

CONCLUDING REMARKS

In this project, information about two interdependent aspects of the problem of dispersed oil sources was studied. First, it was determined how much oil is bought, what kind of oil is bought, and how much oil is disposed of by which method. Second, the reasons why people behave differently were explored. Associations were found between some demographic

attributes of the buyers and their volume of purchases. Associations were also found among a few psychological variables, the current methods of oil disposal, and the intentions to return used oil to central collection facilities.

At different points in this chapter, possibilities for further analyses of the what and the why of the respondents' behaviors and feelings are indicated. Other useful questions can be answered with the present data base.

For example: Are demographic characteristics associated with different methods of disposal? Are income and education related with scales of "ecological consciousness" and "conservation awareness"? Since the number of non-white and white respondents is nearly equal, and since it is generally true that the two ethnic groups vary in income and education distribution, do some of the findings for the entire sample vary substantially in each ethnic group? And, finally, can ways be found to limit to a more manageable range the estimate of how much used oil is likely to be returned if resealable containers are made available?

A word about generalizing the results of the study. Appendix 3B (The Sample) gives an idea of how closely the present sample reproduces some demographic characteristics of the Oakland area. A natural question is to wonder whether this area represents, say, the standard metropolitan areas of the entire country. Simple, though time consuming, computations can be made and a reliable answer obtained.

It should be stressed, however, that other more important factors should be kept in mind, concerning both the ability to generalize the results and any future studies that may be undertaken. First, evidence seems to show that both the what and why may depend on social-psychological predispositions. Thus a sample which is "representative" of age, income, education and race may not be representative of other relevant psychological variables. This is a consideration which is all too often overlooked and may lead to misuses and misinterpretations of higher order statistical analyses. Second, different climates and other environmental conditions throughout the nation may well affect the computation of the annual purchases and disposal of oil. Finally, buyers were observed only during the last three weeks of August. It is probable that the volume of their purchases and their uses of different methods of disposal may vary throughout the year.

3.0 OIL PURCHASES AND TYPES OF BUYERS

3.1 Purchase of Oil

The respondents were buying oil for their cars and motorcycles* for the following purposes:

TABLE 1: Purpose of Purchase

TO ADD OIL ONLY	43.5%	(260)
TO CHANGE THE OIL ONLY	47.5%	(284)
TO ADD AND CHANGE OIL	9.0%	(54)
		598

Of these respondents, twenty-four were buying oil to add to a second car, twenty-nine were buying oil to change in a second car, and eight for adding and changing the oil in their second vehicle. The "add and change" category includes both those people who will first add some oil and later change it, and those who will change their oil first but have anticipated the need for oil to be added at a later time.

Among those who bought oil only to add (260), 73.8% (192) said that they usually change the oil in their vehicle themselves. Therefore, for purposes of studying issues related to the purchase of oil (e.g., consumer attitudes with respect to recycled oil), there is a total of 598 respondents. For issues dealing with the changing of oil (e.g., modes of disposing of used oil), there is an upper limit of 530 respondents (i.e., 192 plus 284 plus 54).

The total quantity of oil purchased by the respondents on the days of the interviewing was 3,027 quarts. Of this amount 774 quarts were used for adding only, 1,722 were used for changing only, and 531 quarts were used for adding and changing.

The amount of oil purchased, or poured into engines, does not equal

---

* There were only 9 respondents who bought oil for motorcycles.

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the amount of oil which is drained from engines during oil changes. Some oil is burned by the engine and is discharged to the atmosphere. Therefore the annual amount of oil used by each respondent for oil changes was computed by dividing a respondent's estimate of how many miles per year he and his family drove a particular vehicle, by his estimate of the average number of miles driven between oil changes. This new quantity was then multiplied by the respondent's estimate of the amount of oil required to change the oil in this engine once:

$$\frac{\text{\# of miles driven/year}}{\text{\# of miles between oil changes}} \times \text{amount of oil required to make an oil change} = \text{annual amount of oil used for oil changes}$$

This estimate was computed for all of the respondents with the exception of those who never change their oil themselves, since their estimates could be expected to be less accurate.

The frequency distribution of annual amounts of oil used for oil changes is shown in Table 2.

TABLE 2

Frequency Distribution of Annual Consumption of Oil for Oil Changes

Total Oil Consumption*	Number of Respondents
1 - 10 quarts	89
11 - 20	157
21 - 30	82
31 - 40	46
41 - 50	22
51 - 60	23
61 - 70	11
71 - 80	17
81 - 90	4
91 - 100	9
More than 100	5
Number of Respondents =	465

The estimates of annual oil usage for oil changes were then summed to obtain the total annual amount of oil involved in oil changes -- 13,300 quarts. The mean is 27.4 quarts per year.

3.2 Who Are The Buyers?

Who are the respondents who buy large versus small amounts of oil annually (relative to each other)? Of course, the size of one's vehicle makes a difference. But if vehicle size is held constant, how does one's

* Estimates of less than 4 quarts and more than 125 are ex

age, education and income correlate with the amount of oil used for oil changes annually? Tables 3, 4, and 5 answer this question.

TABLE 3

Age and Annual Oil Consumption

Age	Number of Respondents	Average Quarts	Total Quarts
18 & under	23	20.985	483
19 - 22	73	24.321	1775
23 - 26	101	28.701	2899
27 - 30	67	26.400	1769
31 - 35	53	29.668	1572
36 - 45	55	32.964	1813
46 - 60	77	31.409	2418
Over 60	25	24.950	624

*Estimates of less than 4 quarts and more than 125 are excluded.

TABLE 4

Education and Annual Oil Consumption

Education (years)	Number of Respondents	Average Quarts	Total Quarts
5	10	27.700	277
6	6	39.600	238
7	6	15.417	93
8	12	35.052	421
9	9	34.556	311
10	21	29.400	617
11	21	25.168	529
12	153	27.802	4254
13	46	29.648	1364
14	60	29.627	1778
15	33	30.511	1007
16	42	24.272	1019
17	55	26.315	1447

TABLE 5

Income and Annual Oil Consumption

Income	Number of Respondents	Average Quarts	Total Quarts
Under $3000	40	22.684	907
3000 - 4999	32	22.243	712
5000 - 7999	49	26.136	1281
8000 - 9999	73	28.114	2052
10,000 - 14,999	148	27.780	4111
15,000 - 19,999	74	30.497	2257
Over 20,000	50	36.603	1830

Some inferences can be made from these tables. First, the relationship between age and oil consumption is, in principle, complex. The results suggest a nonlinear relationship -- the largest consumers (in terms of average number of quarts used annually for oil changes) are those between 31 and 60 years of age, with both those younger and older consuming considerably less. In essence, large purchases coincide with the high activity period of a person's life.

With respect to education, the relationship is unclear. The largest average users are men who have not completed high school, but increased education does not seem to bring lower oil usage, except, perhaps, for those in the highest educational categories. Further data analyses could clarify this relationship (e.g., by considering the respondent's occupation).

There is a strong positive relationship between annual income and oil consumption. With the exception of only one category, oil usage for oil changes increases steadily with income.

A typology (in Euclidean space) was computed of the respondents based on their age, education, income, residence (house/apartment), and ethnicity. Four distinct types were found which differ significantly, particularly with respect to age, education, income, and annual oil comsumption. The four types are defined in Table 6.

TABLE 6

O-Types Derived From Demographic Data

	Lodge	Age	Grade	Income	Race
Type 1	1.3600	33.9400	13.8400	5.0267	1.7667
Type 2	1.2586	62.5517	10.0345	3.7586	1.6552
Type 3	1.2043	48.4731	11.9462	5.1183	1.7204
Type 4	1.4806	22.9894	13.4028	4.0141	1.7668

Where for Lodge, 1 = house and 2 = apartment;
Age is coded directly;
Education is represented by the last grade completed;
Income is coded directly in thousands of dollars earned annually;
Where for race, 1 = white and 2 = non-white.

Referring to Table 6, those respondents in Type 4, for instance, tend to live in apartments, have an average age of twenty-three years, have attended some college, earn about four thousand dollars a year, and include a relatively high number of non-whites.

Where these O-types are most different, however, is with respect to their oil consumption:

TABLE 7

Q-Types and Annual Oil Consumption

Q-Type	Number of Members	Total Annual Consumption	Mean Annual Consumption
1	150	3724.25	24.83
2	58	1270.39	21.90
3	93	2921.38	31.41
4	283	7202.40	25.45

From Table 7 it is clear that there is a particularly large difference in the mean consumption figures for types 2 and 3. Type 2 appears to be composed of older men, with relatively low education and income. Respondents with these characteristics would tend not to drive a great deal. In contrast, the members of type 3 are middle-aged, most likely at the peak of their earning power. Although these respondents would tend to rely heavily on their cars, both for commuting and leisure activities, they are also able, because of their relatively high incomes, to take care of their vehicles and change the oil in them frequently. Types 1 and 4 are marked by moderate oil consumption. Type 1 contains people who are over a decade older, have slightly higher educational attainment, and have somewhat higher incomes than those in type 4.

In sum, it is evident that relatively simple demographic characteristics are associated with the quantity of oil bought. Although further analyses would be necessary to assess more precisely the interactions among such variables, the data strongly suggest that any program designed to affect buying patterns would have to take these findings into account.

4.0 WHAT KIND OF OIL IS PURCHASED AND WHY?

4.1 What Grades of Oil Are Purchased?

The present sample was drawn entirely from individuals purchasing oil from retail stores as opposed to service stations. Although no data were obtained on those customers who buy oil at service stations, it appears that those who purchase their oil from retail stores are primarily interested in obtaining high quality oils.

Over 55% of the respondents bought high reputation oil produced by independent oil companies (e.g., Pennzoil, Quaker State, Castrol, Valvoline), and another 20% purchased oils bearing the trademark of a major oil producer (e.g. Standard, Shell, Chevron, Havoline [Texaco]).

Another indication of the desire for oil of high quality is the grade of oil purchased. The findings, shown in Table 8, indicate that over 80% of the respondents purchased the highest grades of oil: API grades SC, SD, and SE.

TABLE 8

Grade of Oil Purchased

	Number of Respondents	%
SC and SE	245	41.7
SD and SE	96	16.3
SC and SD-SE	69	11.7
SE	68	11.6
SA or ML	40	6.8
SC or MS	21	3.6
SB and SC	20	3.4
Others - rated	20	3.4
Others - not rated	9	1.5
	588	100.0

4.2 Brand Name and Price

The concern for high quality in oil purchased was further explored by determining the criteria used by consumers in choosing among oils. The factors are listed below in the order of the frequency with which they were mentioned (a respondent was allowed to name several criteria):

TABLE 9

Factors in Oil Purchase Decisions

Factor	Number of times mentioned	Relative Frequency
Brand name	461	56.3%
Lowest price	199	24.3
Viscosity	69	8.4
SAE rating	12	1.5
Recommendations of mechanic, dealer, or manufacturer	13	1.6
Medium price	6	.7
Recommendations of friends or relatives	5	.6
High price	5	.6
Labeling*	3	.4
Other reasons	46	5.6
	819	100.0

Respondents were then asked to rank these factors in their order of importance in deciding which oil to buy. Whereas brand name was mentioned 2.3 times as often as lowest price, brand name was selected as the most important factor in the purchase decision 3.1 times as often as lowest price:

*refers to phrases like "meets or exceeds all car manufacturers' warranty requirements"

TABLE 10

Most Important Factor in Purchase Decision

Factor	Number of times mentioned	Relative Frequency, %
Brand name	349	65
Lowest price	114	21
Viscosity	34	6
SAE rating	8	2
Others	31	6
	536	100

These findings have several implications for the marketability of recycled oil. First, since brand name (which we take as an insurance of high quality in the minds of consumers) is generally more important than lowest price, recycled oil produced by one of the well-known independents or by one of the major oil companies may be able to gain acceptance. Furthermore, as is shown in Table 30 below, recycled oil would be most attractive to the consumer if it were also certified by the government as equal in quality to virgin oil.

4.3 Is Price Related to Quantity Purchased?

Questions arise as to whether those who buy a great deal of oil annually are particularly interested in lowest price and whether those who use relatively little oil can afford to concern themselves with maximizing quality. In other words, one might anticipate that those who buy relatively more oil might mention lowest price as the most important factor in their purchase decision more often than those who buy relatively less oil.

Table 11 shows, however, that, if anything, those who buy larger volumes of oil are less concerned with buying oil on the basis of lowest price than those who buy smaller quantities of oil.

This finding could be interpreted in several ways. First, large purchases of oil may indicate high vehicle usage (and, therefore, a high degree

TABLE 11

Most Important Factor in Purchase Decision
and Annual Oil Consumption*

Most Important Factor	Very Low		Low		Moderate		High	
	Number of Respondents	%	Number of Respondents	%	Number of Respondents	&	Number of Respondents	%
Lowest price	25	22.9	27	21.6	27	19.7	10	15.4
Brand name	71	65.1	84	67.2	83	60.6	45	69.2
Viscosity	9	8.3	2	1.6	7	5.1	3	4.6
SAE rating	0	0	2	1.6	5	3.6	0	0
Labeling	0	0	0	0	0	0	1	1.5
Performance	0	0	3	2.4	5	3.6	2	3.1
Other	4	3.7	7	5.6	10	7.3	4	6.2

* The observed relationship is statistically significant at the 0.136 level.

ow: less than or equal to 12 quarts per year

over 12 but less than or equal to 20 quarts per year

te: over 20 but less than or equal to 50 quarts per year

over 50 quarts per year

r of Respondents = 436

of reliance on the vehicle), which could explain the desire to maximize quality rather than minimize cost. Similarly, frequent oil changes may reflect meticulous car care; such an owner would probably want the best oil possible for his car, regardless of price. Further, it is possible that those who buy greater volumes of oil own larger cars, and therefore require more oil per change, than those who buy smaller volumes of oil. In any case, the major significance of this finding is that low price does not constitute a powerful means by which to influence those who buy a large volume of oil annually.

4.4 A Semi-Technical Note

The identification and measurement of the reasons underlying people's behavior are complex and time consuming operations. They usually require a number of "pre-tests" and data analyses before reliability and validity can be established. Although these operations were omitted in this study, a factor analysis has been performed for the responses in Tables 9 and 10, separately. Some interesting results were obtained. First, price and brand name measure with high reliability one "cognitive" dimension (i.e., reason) in the minds of the respondents. Furthermore, price and brand are negatively associated in this dimension.

The results indicate, however, that much more probing will be necessary should one be interested in a more precise identification of the respondents' motivations and their effects on quality and quantity of oil purchased by different types of people.

5.0 LOCATIONS AND REASONS FOR CHANGING ONE'S OWN OIL

5.1 Where is the Oil Change Performed?

One of the goals of this effort was to determine the following (for those respondents that change their oil at least some of the time): (1) who changes the oil, (2) where is it changed, and (3) the reasons why the respondent changes his own oil.

Of the 531 respondents who buy oil for oil changes, 95% change the oil themselves or have a friend do it. Among this group of the 496 people, there is substantial variation as to where they change their oil:

TABLE 12

Location of Oil Change for Those Changing Their Own Oil

Location	Number of Respondents	Relative Frequency, %
Home garage	192	38.7%
Street or driveway	209	42.1
Service Station	79	16.0
Others	16	3.2
	496	100.0

Since only 16% of those who change their oil themselves do it at a service station, the vast majority of respondents probably experience some difficulty in disposing of their oil. They may not have suitable containers in which to put their waste oil and may not know where to dispose of it.

5.2 Why Do They Change Their Own Oil?

The most common reason given for changing and adding one's own oil was the savings involved. As mentioned earlier an individual's decision to purchase oil at a discount store is motivated primarily by a desire to save money. Since nearly all service stations and garages charge persons who purchase their oil elsewhere a significant fee for changing oil, little or no savings would be realized by buying oil at a discount store and paying someone else to change it. Evidently, spending a little extra at the discount store in order to obtain the best grades of oil is rationalized by the savings which results from servicing one's own vehicle.

Cost was not the only factor which people mentioned as reasons for changing their own oil, however. One hundred and fourteen respondents said that they changed their own oil because they enjoyed doing the maintenance work on their car. Convenience was also a significant reason, as was the belief that it was better for the car.

TABLE 13

Reasons for Changing One's Own Oil

Reason	Number of Times Mentioned	Relative Frequency, %
Cost	378	56
Auto hobby	114	17
Better for car	87	13
Convenience	55	8
Lower quality of oil available at service station	24	4
Other reasons	14	2
	672	100

(a respondent was permitted to give several reasons)

Persons interviewed were then asked which factor was the most important in deciding to change their own oil.

TABLE 14

Most Important Reason for Changing One's Own Oil

Reason	Absolute Frequency	Relative Frequency
Cost	320	64.6%
Auto hobby	63	12.7
Better for car	56	11.3
Convenience	34	6.9
Lower quality of oil available at service stations	12	2.4
Other reasons	10	2.0
	495	100.0

As illustrated in the previous technical note, some further analysis of these "verbal" responses should give a stronger insight into the psychological meaning(s) and the statistical strength of these observed reasons.

6.0 DISPOSAL OF THE USED OIL AND PREDISPOSITION TOWARDS ECOLOGICALLY SOUND MEANS OF DISPOSAL

6.1 How is the Used Oil Disposed?

As shown in Table 12, over 80% of the respondents who change their own oil change it either in their garage or in front of their residence. The following table illustrates the means of disposing of the used oil:

TABLE 15

Means of Disposing of Used Oil

Means	Absolute Frequency	Relative Frequency
Dump in backyard or elsewhere on property	157	33.6%
Take to service station	73	15.6
Take to public dump	54	11.6
Dump in storm sewer	53	11.4
Dump in garbage can	50	10.7
Dump in empty lot	16	3.4
Pour down toilet	4	0.9
Sell	3	0.6
Pour down sink	2	0.4
Use around the house	3	0.6
Other means of disposal	52	11.2
	467*	100.0%

* approximately fifty respondents gave multiple answers

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In addition to the number of respondents who use a particular means of disposal, the annual amount of used oil which was disposed of by each method was determined:

TABLE 16

Annual Amount of Oil Disposed of By
Each Means of Disposal

Means	Annual Amount (quarts)
Backyard	3776
Service station	2014
Public dump	1663
Storm sewer	1244
Garbage cans	677
Empty lots	394
Toilet	145
Sell	9
Others	1858
	11,780 (quarts)

Note that although pouring oil into the storm sewer was mentioned only one time less than taking it to a public dump, the latter method of disposal accounted for about 33 percent more oil than the former method. Consequently (and fortunately), those who use the sewer are relatively light users of oil compared to those who take their used oil to a public dump. Similarly, those consumers who place their used oil in garbage cans also appear to be light users relative to both of the groups mentioned above.

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6.2 Predispositions Toward Ecologically Sound Means of Disposal

The means of disposal listed in Table 16 require different amounts of activity from each respondent. We can group these means into those that imply "high" or "low" activity as follows:

TABLE 17

Annual Amount of Oil Disposed of By Methods Requiring High Vs. Low Degrees of Activity (in quarts)

High Activity Methods		Low Activity Methods	
Service station	2014	Backyard	3776
Public dump	1663	Storm sewer	1244
Empty lot	394	Garbage	677
Sell	9	Toilet	145
	4080		5842

About 40% of the total amount of oil was disposed of by methods which require a relatively high level of effort. It is therefore possible that there is a significant amount of human energy which might be harnessed in a program of returning used oil to a reasonably convenient collection facility.

These figures also permit an examination of the distribution and amount of pollution generated annually by the respondents. (It has been assumed that used oil which is sold or returned to a service station creates no pollution.)

Oil dumped on the ground will seep down and has some chance of reaching the water table, depending on location of the disposal site. Oil is biodegradable, however, and dumping it in thousands of backyards and lots is preferable to concentrating it in one area, as in public dumps (which in the case of Oakland are located quite near San Francisco Bay.) Oil placed in garbage cans ends up in the public dump, too. Oil flushed down the toilet receives the same processing as sewage, which is to say, processing not designed for oil. In some areas, the storm run-off and sewage are combined in one system, but assuming that they are not, pouring oil down the storm sewer is the most ecologically dangerous form of

especially during the rainy season when the amount of run-off may exceed filtering capacity. Table 18 summarizes the data for the volume of oil disposed of in environmentally harmful ways:

TABLE 18

Water and Land Pollution Caused by Oil Disposal

4,170	quarts are dumped in backyards
2,340	quarts end up in the public dump
1,244	quarts are dumped in the storm sewer
145	quarts are flushed down the toilet
7,899	

6.3 Amount of Trouble Experienced in Used Oil Disposition

In addition to the 73 people who took their used oil to a service station after draining it at home, there were 79 respondents who changed their own oil at a service station. Whereas these 79 respondents were generally omitted from the analysis involving the various means of disposal, the existence of this group should be kept in mind when interpreting particular results. For instance, the responses of these 79 people were not included in the answers to the following question:

> How much trouble do you have getting rid of the used oil -- is it a lot of trouble, quite a bit of trouble, a little trouble, or no trouble at all?

TABLE 19

Trouble in Disposing of Oil

Amount of Trouble	Absolute Frequency	Relative Frequency
A lot of trouble	15	3.6%
Quite a bit	16	3.8
A little trouble	70	16.6
No trouble	320	76.0
	421	100.0%

Since, as is shown in Table 20, those who take their used oil to a service station are the group most likely to say that they experience a lot of trouble, we can assume that adding the 79 respondents who change their oil at a service station would increase, although not dramatically, the estimation of the amount of trouble which consumers experience in disposing of their used oil. The point is not so much that in every case the addition of this group would make a difference for the analysis, for in this instance the association between means of disposal and trouble experienced in disposing of used oil is extremely weak, but rather that the policy maker should be alert to the possible difference the inclusion of this group could make.

TABLE 20

Trouble Experienced By Various Means of Disposal

Means of Disposal	Trouble			
	A lot	Quite a bit	A little	None
Sell	-	-	50% (1)	50% (1)
Service Station	5.1% (3)	3.4% (2)	15.3% (9)	76.3% (45)
Sewer	2.4% (1)	-	11.9% (5)	85.7% (36)
Toilet	-	-	33.3% (1)	66.7% (2)
Garbage	2.3% (1)	4.7 (2)	25.6% (11)	67.4% (29)
Backyard	4.9% (7)	1.4% (2)	11.9% (17)	81.8% (117)
Empty Lot	-	7.1% (1)	14.3% (2)	78.6% (11)
Public Dump	-	7.5% (4)	24.5% (13)	67.9% (36)
Other	3.6% (2)	8.9% (5)	14.3% (8)	73.2% (41)
	3.4% (14)	3.9% (16)	16.1% (67)	76.6% (318)

( ) = number of respondents

6.4 Some Speculations

It is interesting that while some respondents engage in considerable activity in disposing of their oil (e.g., taking it to the public dump),

very few people find it particularly troublesome to dispose of their oil. There is some relationship between the amount of activity involved in disposing of the used oil and the amount of trouble experienced, but the relationship is not particularly strong.

TABLE 21

Effect of Amount of Disposal Activity on Trouble Experienced in Disposing of Used Oil*

	Amount of Trouble			
Activity	A lot Quite a bit	A little	None	Total
High Activity	10 7.8%	25 19.5%	93 72.7%	128 100%
Low Activity	13 5.6%	34 14.7%	184 79.7%	231 100%

Number of Respondents 359

High Activity: Sell, service station, public dump, empty lot
Low Activity: Storm sewer, toilet, backyard, garbage

* The observed relationship is statistically significant at the 0.15 level.

Whereas 27.3% (7.8% + 19.5%) of those engaging in high activity means of disposal experience some trouble, only 20.3% (5.6% + 14.7%) of those engaging in low activity means of disposal experience some trouble. The relationship exists in the expected direction, but it is not as strong as one might have anticipated.

Although the respondents do not experience a great deal of trouble in disposing of their oil, this may be largely at the expense of the environment. It is probably not so much a question of people not caring about what happens to the oil as it is a matter of their not realizing where the oil eventually goes. We can speculate that they are unaware of the ecological implications of their actions.

Compounding the problem is the absense of a well-publicized and feasible means of ecologically-sound disposition. Even those who take their used oil to service stations may encounter resistance since the stations themselves

in some instances must pay to have used oil carted away. Probably, a large portion of the respondents who are able to change their oil at a service station or bring their oil there may be able to do this because the service station has special facilities for user-performed oil changes, they are friendly with the management or because they do it without the knowledge or permission of the service station owners. In sum, the consumer may be relatively unaware of the implications of his actions, and market forces may not be structured to direct used oil into ecologically-sound means of disposal.

7.0 HOW MUCH USED OIL WILL BE RETURNED?

In this section, a few key questions for public management will be examined by identifying some of the psychological processes that may describe the potential success of different options dealing with pollution control policies.

7.1 What "Causes" Willingness to Return Used Oil?

How can public willingness to return resealable containers to a collection facility be estimated? To begin with, the level of willingness of the interviewees is high, as illustrated in Table 22:

TABLE 22

Willingness to Return Oil in Resealable Containers

	Absolute Frequency	Relative Frequency
Definitely would	210	35.9%
Probably would	181	30.9
Might	71	12.1
Probably would not	73	12.5
Definitely would not	50	8.5
	585	100.0%

Experience in conducting surveys has shown that answers to "hypothetical" questions have low predictive values. The results in Table 22 can be analyzed by asking: What factors may account for willingness to return used oil? In Table 23 the amount of trouble that one currently experiences in disposing of his oil is positively related to willingness, but the relationship is not particularly strong:

TABLE 23

Trouble in Disposal and Willingness to Return Used Oil*

Willing to Return	Trouble: A lot / Quite a lot	A little	None
Definitely would	15 50%	32 45.7%	118 37.1%
Probably would	9 30%	24 34.3%	96 30.2%
Might	4 13%	6 8.6%	44 13.8%
Probably not and definitely not	2 7%	8 11.4%	60 18.9%
	30 100%	70 100%	318 100%

* The observed relationship is statistically significant at the 0.25 level.

Since it has already been shown that the amount of activity involved in disposing of one's oil is positively, although weakly, related to the amount of trouble experienced (Table 21), it would not be surprising to find that the amount of disposition activity is positively related to willingness to return used oil. Table 24 shows that this is in fact the case:

TABLE 24

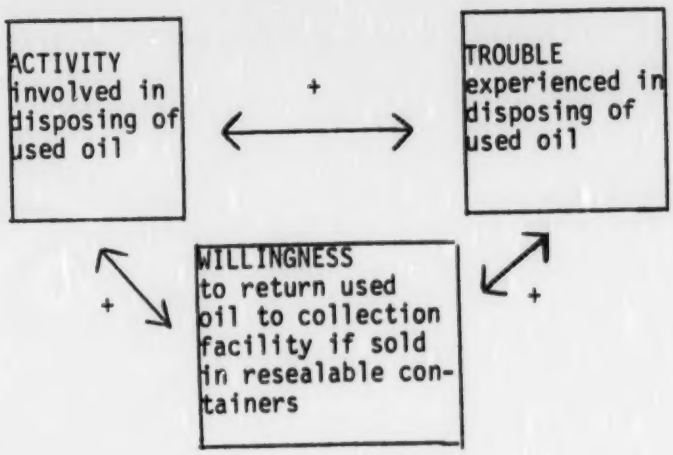
Disposal Activity and Willingness to Return Oil*

Willingness to Return	Activity	
	High	Low
Definitely would	61 47.7%	80 34.8%
Probably would	41 32.0%	70 30.4%
Might	11 8.6%	36 15.7%
Probably would not Definitely would not	15 11.7%	44 19.1%
	128 100%	230 100%

Number of respondents = 358

* The observed relationship is statistically significant at the 0.015 level.

Positive relationships among three psychological variables have been established, but the casual nature, if any, of such relationships has not yet been explored. What is known at this stage can be represented in the flow chart below:


ACTIVITY involved in disposing of used oil
+
TROUBLE experienced in disposing of used oil
+
+
WILLINGNESS to return used oil to collection facility if sold in resealable containers

Is the relationship between "activity" and "willingness" simply due to the intervening effect of "trouble"? Or does "activity" specify the conditions under which the relationship between "trouble" and "willingness" holds more or less strongly?

If the relationship between activity and willingness were spurious (i.e., due to the intervening effect of trouble), then the association between them would be wiped out for each of the two values of the variable "trouble" (i.e., for "no trouble", and for "some or more trouble"). This situation is presented in Table 25:

TABLE 25

Willingness to Return By Trouble in Disposal and Activity in Disposal

Willingness	Trouble: Some or More Means of Disposal, High Activity	Trouble: Some or More Means of Disposal, Low Activity	Trouble: None Means of Disposal, High Activity	Trouble: None Means of Disposal, Low Activity
Definitely would	24 63.2%	18 36.0%	39 41.5%	62 33.0%
Probably would	13 34.2%	19 38.0%	30 31.9%	55 29.3%
Might	0	7 14.0%	11 11.7%	30 16.0%
Probably would not Definitely would not	1 2.6%	6 12.0%	14 14.9%	41 21.8%
	38	50	94	188

The figures in Table 25 clearly show that the relationship between activity and willingness is not spurious; in fact, it is specified by the variable trouble. When trouble is experienced, the relationship becomes stronger; when it is absent, the relationship becomes weaker.

7.2 Some Implications for Public Management

What are the implications for public management of the psychological process which seems to underlie the respondents' willingness to return used oil in resealable containers to central collection points? This question can be answered by proceeding in two steps.

First, the number of respondents likely to return used oil must be determined. For example, 35% of the interviewees said they would definitely do so (Table 22). However, the relationships established in Table 25 indicate that this willingness depends on the amount of trouble experienced and the activity implied by the methods of oil disposal.

This suggests that respondents who said they were willing to return the oil may have a different probability of doing so. To illustrate, while the respondents who experience trouble and dispose of their oil by a high activity method may be very likely to return used oil to a central collection point (24 respondents), the respondents at the opposite end of the scale (no trouble, low activity) may be much less likely to do so (a total of 62 respondents). The same considerations apply to the interpretation of the other degrees of willingness in Table 25.

All in all, the number of people who will return used oil to a central facility may differ substantially from the verbal "hypothetical" responses recorded in Table 22. Further data analysis could yield an estimate of the probability of respondents to do in fact what they think they would do, and thus provide an estimate of the size of the "good" market segment.

Now, step two. As in many other management questions, the size of the market potential depends not only on number of people but also, and more importantly, on the volume of their purchases; that is, in this study, on the volume of used oil returned to the environment. For instance, the 24 respondents who may have the highest probability to return their used oil may account for only a tiny fraction of the oil consumed annually. Table 26 provides the required information:

TABLE 26

Annual Oil Consumption (In Quarts) By Activity and Trouble In Disposal and Willingness to Return Used Oil

	Trouble				
	Some Disposal Activity		None Disposal Activity		
Willingness	High	Low	High	Low	Total Volume of Oil
Def. Would	639	482	1399	1502	4022
Prob. Would	332	278	918	1698	3226
Might	0	132	394	772	1298
Prob. Would Not Def. Would Not	3	145	486	1142	1776
	974	1037	3197	5114	10,322

Table 26 indicates that those who experience no trouble dispose of more oil than those who experience some trouble. Similarly, more oil is disposed of by those who engage in little disposal activity than by those who exert much energy.

It can now be asked: How much used oil will be returned to central collection facilities? The complexity of the information in Table 26 calls for a cautious answer.

First, if the respondent's expressed willingness were to be "trusted", one would predict that 4,022 quarts, plus some percentage of 3,226 quarts, would be returned.

Second, if the willingness of only those respondents who experience some trouble and currently dispose of oil by high activity methods were to be trusted, then one would predict that 639 quarts, plus some percentage of 332 quarts, would be returned.

It should be clear that other estimates are also legitimate on the basis of the results in Table 26. As suggested earlier, one way to narrow the range of possible estimates is to compute first the probability of returning used oil for each of the relevant cells in the table, and then employ regression methods.

In this study, strong evidence has been found to show that "returning

used oil" is a complex domain. Further analyses are necessary if policy decisions are to be based on the prediction of how much oil is likely to be returned.

The remaining part of this report adds further evidence supporting this call for caution in interpreting the data presented so far.

8.0 ARE THERE OTHER FACTORS AFFECTING WILLINGNESS TO RETURN USED OIL?

8.1 What is a "Reasonable" Deposit for a Resealable Container?

The interviewees were presented with a hypothetical question: "If there were a deposit required for these resealable containers, what do you feel would be the minimum deposit charge that would make you return the container?"

Recall that the respondents' willingness to return oil explicitly referred to oil in resealable containers. Therefore, the interviewees' estimate of the "minimum" deposit acceptable to them will be interpreted as another indicator of their willingness to return used oil.

Twenty-one people gave no amount, and the others gave the estimates recorded in Table 27:

TABLE 27

Hypothetical Deposit Which Would Induce Oil Return (In Cents)

Deposit	Abs. Freq.	Rel. Freq.,%
1-5	138	27
6-10	136	26
11-20	52	10
21-30	82	16
31-50	58	11
51-97	8	1
98 or more	45	9
	519	100

Mean = 24.5

The amounts given are high when taken as a percentage of the cost of one can of oil. In a more comprehensive survey, however, one could explore whether consumers can appreciate that one deposit, in the long run, applies to many oil changes. Note also that in this study the respondents may have answered the question thinking only in terms of one can of oil; if forced to think about the number of quarts used per change (and therefore the total amount required as a deposit), they might lower their estimates.

The responses in Table 27 have been examined by relating them with the interviewees' annual oil purchases and with their incomes. No correlations were found. For instance, those who buy relatively large volumes of oil are no more likely to mention a low deposit than those who buy relatively small volumes of oil. Similarly, those in higher income groups are no more likely to mention a high deposit than those in lower income groups.

8.2 Does "Ecology-Consciousness" Affect Willingness to Return Used Oil?

The data collected may give further insights into the respondents' probability of returning used oil. Willingness to return used oil might be influenced by one's "ecology-consciousness". Although no direct measure of this was made in the survey, one may assume a latent connection between a respondent's predisposition toward ecologically-sound waste disposal and the means by which he currently disposes of his own oil.

To test this, an ordinal scale measuring the extent to which various means of oil disposal are ecologically acceptable was constructed. The criterion for ecological acceptability was the probability of the oil entering San Francisco Bay. Taking one's oil to a service station receives the highest score because it minimizes the probability of the oil entering the Bay. While the scale is specific to the San Francisco Bay area, similar scales could be constructed for any given area.

The scale's categories are as follows:

BEST -- selling or taking oil to service station
GOOD -- dumping in backyard or empty lot
FAIR -- dumping in garbage can and taking to public dump
POOR -- flushing down toilet or dumping in storm sewer

The relationship between this scale (an ecological evaluation of means of disposal) and willingness to return used oil can now be examined. As Table 28 indicates, there is some association.

TABLE 28

Ecological Rating of Respondent's Means of Oil Disposal and His Willingness to Return Used Oil*

	Ecological Rating			
Willingness	BEST	GOOD	FAIR	POOR
Def. Would	31 50%	49 31.4%	45 47.4%	16 36.6%
Prob. Would	20 32.3%	44 28.2%	31 32.6%	16 36.6%
Might	5 8.1%	25 16.0%	9 9.5%	8 17.8%
Prob. Would Not Def. Would Not	6 9.7%	38 24.4%	10 10.5%	5 11.1%
	62	156	95	45

* The observed relationship is statistically significant at the 0.025 level.

8.3 Does "Conservation Awareness" Account for Willingness to Return Used Oil?

Perhaps willingness to return used oil reflects one's awareness of problems of conservation more than one's awareness of problems of pollution (e.g., as indicated by one's means of disposal, and the ecological rating of it in Table 28). In other words, "Ecology Consciousness" could have both a pollution component and a conservation component, with only the latter being relevant in explaining differences in willingness to return used oil.

The respondents were asked two questions related to awareness of issues concerning conservation of resources. The questions focused on the respondents' awareness of the availability of recycled oil, and whether they had ever purchased recycled oil.

Thirty-two percent of the respondents (191) said that they knew that recycled oil was available on the market. However, only 21.6% of these

respondents (41), or about 7% of the entire sample, said that they had ever bought recycled oil. Forty-seven respondents, or 7.9% of the total sample, thought that recycled oil was not available on the market. The majority of the respondents, 60.1%, did not know whether or not recycled oil was currently available on the market. In sum, a minority of respondents knew of recycled oil availability, and only a minority of these respondents ever purchased it.

If buying recycled oil indicates a concern for the recycling of non-renewable natural resources, it might serve as an indicator of a respondent's willingness to return his waste oil. Table 29 shows the relationship between these two variables:

TABLE 29

Buying Recycled Oil and Willingness to Return Used Oil*

Willingness to Return Used Oil	Buys Recycled Oil	
	Yes	No
Def. Would	8 32%	40 42.1%
Prob. Would	8 32%	33 34.7%
Might	3 12%	9 9.5%
Prob. Would Not Def. Would Not	6 24%	13 13.7%
	25	95

Number of respondents = 120

* The observed relationship is statistically significant at the 0.30 level.

The number of respondents is too small to make strong statements but, if anything, those who buy recycled oil are less willing to return their used oil! Thus, no evidence was obtained of a positive association between conservation-consciousness and willingness to return waste oil to a col lection facility.

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Prob. Would Not Def. Would Not	6 24%	13 13.7%
	25	95

Number of respondents = 120

* The observed relationship is statistically significant at the 0.30 level.

The number of respondents is too small to make strong statements but, if anything, those who buy recycled oil are less willing to return their used oil! Thus, no evidence was obtained of a positive association between conservation-consciousness and willingness to return waste oil to a collection facility.

9.0 A PROBE INTO CONSERVATION OF RESOURCES

Although the survey focused on used oil as a potential pollutant, a few issues concerning conservation of resources with reference to recycled oil were also explored.

9.1 Government Certification

The interviewees were asked a question directly concerning consumer acceptance of recycled oil; that is:

> If the government certified that the recycled oil you were buying was as good as the brand new oil you usually buy, how would that affect your willingness to use recycled oil?

The responses reveal a rather high hypothetical public willingness to try government certified recycled oil:

TABLE 30

Respondent Willingness to Use Government Certified Recycled Oil

Willingness	Abs. Freq.	Rel. Freq.
Definitely Would Buy	156	26.3%
Probably Would Buy	184	31.0
Might or Might Not Buy	112	18.9
Probably Would Not Buy	62	10.5
Definitely Would Not Buy	79	13.3
	593	100.0%

Less than a quarter of the sample are negatively predisposed toward government certified recycled oil. One can most likely assume that government certification is a crucial factor in getting consumers to try a recycled oil, especially in light of the high concern for quality manifested by the majority of the respondents (see Section 4.1).

9.2 A Probe Into Semantics

There was a great deal of agreement among the interviewees on which "name" for recycled oil implies the highest quality. Respondents were asked which of the following terms they would expect to imply oil of the highest quality:

TABLE 31

Respondent Impression of Highest Quality Oil for Different Terms

Name	Abs. Freq.	Rel. Freq.
Re-refined	294	51.5%
Reprocessed	114	20.0
Recycled	75	13.1
Reclaimed	22	3.9
Recovered	21	3.7
All mean the same	45	7.9
	571	100.0%

The label "re-refined" has the greatest appeal probably because it implies that the entire process of crude oil refining is repeated from the beginning.

ACKNOWLEDGMENT

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APPENDIX A

CONSUMER SURVEY QUESTIONNAIRE

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WCCS 386
August 1973

WEST COAST COMMUNITY SURVEYS
2288 Fulton Street
Berkeley, California 94704

Serial No:_____

Store Name:_____

Street:_____

City:_____

Date of Interview:_____

Time Began:_____ a.m. / p.m.

Hello, I'm _____ of West Coast Community Surveys and I'm working on a research study which involves talking to men who buy motor oil and I'd like to ask you a few questions.

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1. A. What brand of motor oil (are you buying) (did you just buy)? CIRCLE ALL THAT APPLY. USE ONE COLUMN FOR EACH, ASKING B - H FOR ONE, BEFORE ASKING ABOUT NEXT. IF 2 OR MORE BRANDS AND/OR GRADES, USE EXTRA COLUMN TO PERMIT SINGLE CODING	Pennzoil. . . . .1 Standard. . . . .2 Shell . . . . . .3 Exxon . . . . . .4 Other (SPECIFY: _____5	Pennzoil. . . .1 Standard. . . .2 Shell . . . . .3 Exxon . . . . .4 Other (SPECIFY: _____5
B. What grade is that? STAMPED ON LID. IF MORE THAN ONE RATING IS GIVEN, CIRCLE EACH. IGNORE STAMPED LETTERS OR NUMBERS NOT LISTED IN COLUMN.	SA or ML. . . . .1 SB or MM. . . . .2 SC or MS. . . . .3 SD or MS 1968 . .4 SE. . . . . .5 No rating 6	SA or ML. . . .1 SB or MM. . . .2 SC or MS. . . .3 SD or MS 1968 .4 SE. . . . . .5 No rating . . .6
C. How much of this (BRAND & GRADE) (are you buying)(did you buy)?	_____quarts	_____quarts
D. And what car or other vehicle are you going to use this (BRAND & GRADE) for -- can you give me the make and year? IF NOT FOR AUTO OR MOTORCYCLE, THANK AND TERMINATE. IF 2 OR MORE VEHICLES, USE EXTRA COLUMNS.	Make_____ 19_____	Make_____ 19_____
E. On the average how many miles per year would you say you and your family drive this (VEHICLE)?	_____miles per year	_____miles per year
F. (Are you buying)(Did you buy) the (BRAND & GRADE) to add to your (VEHICLE), to change the oil in your (VEHICLE), or both?	Add Only . . . . 1* Change Only. . . 2 Add & Change . . 3	Add Only. . . . 1* Change Only . . 2 Add & Change. . 3
*G. IF ADD ONLY: Do you usually change the oil in your (VEHICLE) yourself?	Yes (ASK H). . . 1 No (SKIP TO Q 2) 2	Yes (ASK H) . . 1 No (SKIP TO Q 2)2
H. IF EVER CHANGES OIL: a. On the average how often do you change the oil in your (VEHICLE) -- about how many thousand miles? b. How much oil does that usually take? c. Do you ever change your own oil filter? *IF YES: Every how many thousand miles?	Changes every _____miles _____qts Yes . . . . . 1* No (SKIP TO Q 2) . . . . . 2 Changes every _____miles	Changes every _____miles _____qts Yes . . . . . 1* No (SKIP TO Q 2) . . . . . 2 Changes every _____miles

2. A. ASK ALL:

How do you decide which oil to buy -- do you go by price, brand name, or what? CODE ALL THAT APPLY IN FIRST COLUMN BELOW.

B. IF MORE THAN ONE FACTOR MENTIONED: And now I'd like you to rank these factors in the order of importance to you in deciding which oil to buy. (Which one is the most important?) (Second?)

	A	B
Lowest price.	1	_____
Quality		
Brand name.	2	_____
Viscosity (e.g. 10-30).	3	_____
SAE rating.	4	_____
Labeling.	5	_____
Other (SPECIFY:_____	6	_____

3. IF ADDS ONLY, SKIP TO Q 5

A. IF EVER CHANGES OIL IN Q 1: Do you change the oil yourself, take it to a service station and have them do it, or what?

Do it myself. 1*

Have service station do it. 2

Have dealer do it 3

Other (SPECIFY:_____ 4*

*IF DO IT MYSELF OR DONE BY FRIEND/RELATIVE:

B. Where do (you)(he/she/they) do it -- in the garage at (your)(their) house, on the street, in a drive-way, at a service station, or where?

Home garage 1

On street or in driveway. 2

Service station 3

Car dealer. 4

Other (SPECIFY:_____ 5

C. Why do you (change)(change and add) your own oil -- is it because it costs less, because automobiles are your hobby, or what? CODE ALL THAT APPLY.

IF MORE THAN ONE MENTIONED: Of the reasons you mentioned, which would you say is the most important reason? CHECK APPROPRIATE BOX.

	MOST IMPORTANT
Cost. 1	[ ]
Convenience 2	[ ]
Auto hobby. 3	[ ]
Equal to or better than oil at service station or car dealer 4	
Better for car. 5	
Other (SPECIFY:_____ _____ 6	

4. IF EVER CHANGES OIL AWAY FROM SERVICE STATION OR DEALER:

A. How do you eventually dispose of the used oil -- do you sell it, take it to a service station, dump it in a sewer, flush it down the toilet, put it in your garbage can, take it to the dump, or what? (CODE ALL THAT APPLY)

Sell 1

Take to service station. 2

Storm sewer. 3

Toilet 4

Dump in garbage can. 5

Burn in incinerator. 6

Dump in backyard 7

Dump in empty lot. 8

Take to public dump. 9

Other (SPECIFY:_____)10

B. How much trouble do you have getting rid of the used oil -- is it a lot of trouble, quite a bit of trouble, a little trouble, or no trouble at all?

A lot of trouble 1

Quite a bit of trouble 2

A little trouble 3

No trouble at all. 4

---

5. ASK ALL: It's been suggested that there is technology to take the used oil and reprocess and purify it.

A. I'd like you to look at the five terms on this card. HAND CARD 5A. Which would you expect to be the highest quality oil?

Recycled 1

Re-refined 2

Reprocessed. 3

Reclaimed. 4

Recovered. 5

All mean the same. 6

B. Do you happen to know whether any of these is currently available on the market or not?

Yes, available 1*

No, not available. 2

DK 3

*IF YES: Do you buy any of them?

Yes. 1

No . . . . . .

C. If the government certified that the recycled oil you were buying was as good as the brand new oil you usually buy, how would that affect your willingness to having recycled oil. HAND CARD 5C & D. Which of these comes closest to describing whether you would or would not buy recycled oil if it were government certified?

A. Definitely would buy. 1
B. Probably would buy. 2
C. Might or might not buy. 3
D. Probably would not buy. 4
E. Definitely would not buy. 5

D. If all oil -- whether it was brand new oil or reprocessed oil -- were sold in resealable containers, how likely would you be to return your used oil to a collection facility? Please choose one of the categories on the card.

A. Definitely would return 1
B. Probably would return 2
C. Might or might not return 3
D. Probably would not return 4
E. Definitely would not return 5

E. If there were a deposit required for these resealable containers, what do you feel would be the minimum amount for a deposit charge that would make you return the container?

---

6. Now a couple of background questions about you and I'll be all through --

A. Do you live in a house, an apartment, or what?

House 1
Apartment 2
Other (SPECIFY:_____ 3

B. Do you own or rent?

Own 1
Rent. 2

C. May I have your age on your last birthday? _____ years of age

D. And what was the highest grade of school you completed?

	← Hi School →				← College →				
Less than 6th grade 6 7 8	9	10	11	12	13	14	15	16	17+

E. Please tell me which of these comes closest to what you do. I just need the letter. HAND CARD 6E. (IF CURRENTLY UNEMPLOYED, CHECK APPROPRIATE BOX AND ASK: What is your usual occupation?) (IF RETIRED, CHECK APPROPRIATE BOX AND ASK: What was your occupation before you retired?)

[ ] UNEMPLOYED

[ ] RETIRED

A. Small businessman 02

B. Clerk/typist/secretary. 04

C. Unskilled or manual 06

D. Student 08

E. Professional, technical 01

F. Salesman. 03

G. Skilled crafts. 05

H. Farmer. 07

I. Armed Forces member 09

J. Other (SPECIFY:_____

_____ 10

F. And would you pick the letter on this card that indicates which income group you and your family are in. Please count all sources of income for you and the other members of your family living with you before taxes. HAND CARD 6F.

A. Under $3,000. 1

B. $3,000 - $4,999 2

C. $5,000 - $7,999 3

D. $8,000 - $9,999 4

E. $10,000 - $14,999 5

F. $15,000 - $19,999 6

G. $20,000 and over. 7

G. If you're interested, we can make the report of our findings available for you to look at. And also my supervisor will be checking a small percentage of my work at random. In case this interview is selected or if you'd like to see the results of this project, may I have your name, address and phone number?

NAME:_____ PHONE:_____

ADDRESS & CITY:_____

THANK R AND COMPLETE LAST PAGE

Time ended: _____ AM / PM

BEST GUESS OF RACE FROM OBSERVATION:

White 1
Black 2
Oriental. 3
Mexican 4
Other (SPECIFY: _____ 5

INTERVIEWER'S SIGNATURE: _____

APPENDIX B

THE SAMPLE

The respondents, interviewed in eleven retail stores either in or adjacent to the city of Oakland, were males fifteen years old and above. The age distribution of respondents is generally representative of that of Oakland, although young people are slightly overrepresented and old people are slightly underrepresented.

The sample is not representative of Oakland with respect to ethnicity. Forty-five percent of the respondents were blacks, whereas only 34 percent of Oakland's population is comprised of blacks. Similarly, 42% of the sample were whites, whereas 59% of Oakland is white. The sample also included 29 orientals and 40 chicanos. The roughly equivalent number of non-whites and whites offers the advantage of allowing for statistically significant comparisons of the two groups. Although this possibility was not pursued in the analysis, it could prove valuable in future studies.

The sample contains a high number of well-educated respondents when compared to the popualtion of Oakland. While 29% of Oakland's male citizens have attended or graduated from college, approximately half of the respondents have this distinction. This is probably related to the fact that the sample contains a relatively higher number of young people, but it may also reflect higher average educational attainment of those people who change their own oil.

The sample is roughly representative of Oakland in terms of annual income although lower income categories are slightly underrepresented. For example, while 21% of Oakland's population earns less than $5000 annually, only 15.3% of the sample fell into this category.

Finally, the sample is reasonably representative of those whose family owns their housing unit versus those whose families rent. The sample is slightly biased toward those whose families own their dwelling units -- 50.2% of the sample own their own homes while only 42.4% of Oakland families own their own homes.

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